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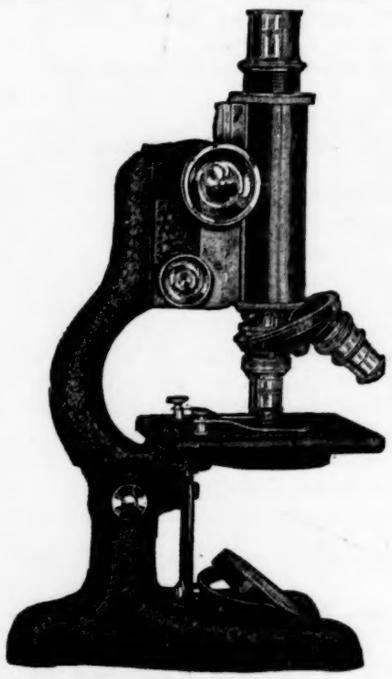

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SIGMA XI AND THE FUTURE[1]

Members of Sigma Xi, Initiates and Guests:

For many years it has been the custom in our chapter upon the occasion which each year corresponds to this, for the president of the chapter to read an address in order to explain the more clearly to those whom we are honored to receive into membership the spirit of Sigma Xi. In some instances this address has taken the form of a description of a piece of research; in others a general statement of the function of Sigma Xi in furthering the cause of research. Much as I should like to be relieved of the honor of addressing you this evening, I feel that it would ill become me to change so time-honored a custom. And accordingly I beg your indulgence while I discuss some of the problems and the obligations before Sigma Xi, at least as I see them. This subject seems to me to be particularly appropriate just now because of the uncertainty of the conditions to be met in the new era, into which, we are all agreed, we are entering.

First, however, permit me to review briefly the history of Sigma Xi—this with the double purpose of acquainting our new members with the origin and development of the society which, to-night, they are joining, and of furnishing a foundation upon which logically to discuss the problems before us. For we must build the future upon the experience of the past.

To those of us whose educational home is Cornell, Sigma Xi has a peculiar significance, for it was here, thirty-three years ago, namely in 1886, that the society was founded, and it is from here that the society has spread, until now chapters are found in nearly every large institution of learning in the country. How was it that these young men, in this

[1] Presidential address before the Alpha (Cornell) Chapter of Sigma Xi, May 17, 1919, upon the occasion of the initiation of new members.

young university, at that time less than a score of years old, came to found a society which has exerted such a marked influence upon the progress of science? Perhaps they had absorbed something of the spirit of the place, a spirit of faith in the future, which, in the early days made Cornell a leader in so many lines of university activities, and by the very originality and boldness of the idea which they conceived foreshadowed that for which the society now stands.

We shall probably never have a complete account of the events in the spring, summer and autumn of 1886 that led to the formal establishment of the society. The existing records are very meager; many of them undated; and what has been written is largely the result of piecemeal compilation. I can, however, give you a glimpse of those early days, so full of interest and inspiration to us of the present generation as we look backward, by letting one of the founders speak for himself—Mr. W. H. Riley, of the class of '86, and a charter member of the Alpha chapter:

> You asked me to tell you about Sigma Xi. Well it has been so long ago that I have forgotten most of the details but I will tell you as much as I can remember. During my last three years in Cornell I ate with a bunch of boys who were mostly Arts students and most of them very good students. Every spring some of the boys won their Phi Beta keys and of course these were the occasions of congratulation and discussion. In the spring of 1886 two of my best friends received their keys, which started me to thinking that there should be some honors bestowed on the scientific students who had done good work. I discussed the question with W. A. Day, my chum, an engineering student, and we grew very enthusiastic over it. At this time there was an instructor in Sibley College, Mr. Frank Van Vleck, with whom we were very intimate. He was a graduate of Stevens Institute and was brought to Cornell by Dr. Thurston when he came from Stevens. We mentioned the subject to Mr. Van Vleck one evening while seated under the trees on the corner of Factory (now Stewart) Avenue and State Street, in front of our boarding house; he was much taken with the scheme and thought it should be worked up immediately. This was about the first of May. From that time until commencement we often held meetings, the three of us, under the trees or walking down town. Mr. Van Vleck consulted the faculty and Mr. Day and myself the students. Everybody thought it was a good scheme, but as graduation was so near we could not get them aroused. The week before commencement we had a meeting and decided to stay awhile after the close of college and work the matter up, but I was called home directly after commencement. Mr. Day and Van Vleck stayed until they had everything planned out. We had some correspondence during the summer but it has all been mislaid. Mr. Van Vleck presented his scheme in the fall of 1886 and a society was formed.

The idea then originated with these three men: Messrs. Riley and Day, of the class of '86, and Mr. Van Vleck, an instructor in Sibley College and a graduate of Stevens Institute of the class of '84. With them there were associated in perfecting plans in the autumn of 1886, six other young men: three of them graduates of Rensselaer Polytechnic Institute, of the class of '86, then students at Cornell, and one each from the Cornell classes of '86, '87 and '88—young men, under twenty-four, all of them. They planned a society whose watchword should be "Friendship"; and they joined hands "in forming a brotherhood in science and engineering which should promote and encourage by strong personal attachments of friendship the highest and truest advances in the scientific field" and which should "lend aid and encouragement to those newer brothers, who, likewise laboring in the same spheres, were aspiring to honored positions." They agreed to "lend their efforts to the establishment of an organization to be publicly known as the 'Society of the Sigma Xi.'"

About the same time the late Professor Henry Shaler Williams, then professor of geology at Cornell, realizing the need of an honorary society for scientific students, similar to Phi Beta Kappa, drew up a plan for a society to be known as "The Society of Modern Scientists," the object of which should be to recognize by some mark of honor, "those who exhibit special ability in investigating, understanding and interpreting the facts of nature in the various branches of modern science, in order to encourage high attainments among

the future students of Cornell University and of other kindred institutions."

These two movements, independently and stimultaneously started, soon came into contact, and finding so much in common, at once joined hands, keeping the name of the organization already perfected by the younger men, but extending its scope and influence according to the council and advice of the older man. Shortly after, apparently in the winter of 1887, four faculty members and five graduate students were invited to become members of the new organization. In the spring of 1887 is recorded the establishment of two chapters, one at Union College and one at Rensselaer. For some reason comparatively little progress was made in further extending the movement although six more chapters were authorized by the parent chapter and plans for the organization of still others were made. None of these, however, were established, and after many discouragements some of the leaders became disheartened, thinking that after all the time was not ripe for such a movement. But finally a charter was voted to Kansas in 1889. This was the status of the society until 1893, when a convention of the four chapters was held in Ithaca, at the call of the parent chapter and a national organization was formed. In 1895 a charter was granted for the establishment of a chapter at Yale, and from that time on there has been a steady increase in the chapter roll. At present there are thirty chapters, in nineteen different states, with a total membership of nearly 12,000 of whom about 2,500 are resident in the universities where chapters are located, and are therefore classed as *active* members, while the remainder, not being directly resident in the chapter, are called alumni, or non-active members.

During its third of a century of existence the motto of the society has been "Companions in Zealous Research"; its object, to encourage "original investigations in science, pure and applied"; and it has sought to accomplish this purpose, in the main, by three different classes of activities: first, by holding meetings for the discussion of scientific subjects and by printing such scientific material as may seem desirable; second, by establishing fraternal relations among investigators in scientific centers; and third, by granting the privilege of membership to such students as, during their college course, have given promise of future achievements in the field of science. While the activities of the several chapters have been varied to suit local conditions, it has been their common object to emphasize that which all investigators have in common: that indefinable something which goes by a variety of names; which "can be felt but not itself investigated"; that something within him which the investigator satisfies by seeking out the truths of nature and then making them known to his fellow men, with a faith, usually unexpressed, that some day these same truths would make the world better, though perhaps a busier, place to live in.

Such then has been the origin, development and activities of the society to which we belong. It is to be hoped that we will carry with us into the future these same ideals, and perhaps many of these same activities, which have made so much for the success of the society in the past. But without doubt the world is now entering a new era, a new order of things, in which every institution, whether political, economic, educational or scientific, will face new conditions, new obligations, and new opportunities. Just as the scientist, in his field, is a pioneer, so he should be among the first, if not the leader, in making his field ready for this new order of things. We may then well ask: Can Sigma Xi adequately discharge her responsibilities in this new era without an extension, perhaps a radical extension, of her former activities and influence? The very form of the question indicates a negative answer.

Before discussing these extensions, I should like to point out that the sphere of influence of Sigma Xi has, up to now, been confined almost exclusively to university circles. With the exception of that at Washington, the chapters are all located at universities. This is not so significant as is the fact that only those who are members of the university community can be *active* members. The result is that over

three quarters of those who have been elected are alumni, or non-active members, and have no connection with any chapter, or indeed with the society. And another point is that the activities of the society have been largely internal, in the same sense, roughly speaking, that a fraternity exists for the benefit of those who are members of it, and whatever outside influence it exerts is of a passive, rather than an active kind. The young investigator may aspire to the honor of an election to membership, but there is at least a gain of truth in the definition that "an honor is that which one does not appreciate *after* one gets it."

Broadly speaking we may classify the fields in which Sigma Xi may extend its influence as local, national and—it may be a dream, but I am going to add—international.

The local problems confronting each chapter are more or less peculiar to the chapter, and in discussing these I can only speak of conditions existing here at Cornell. How can we, right here at home, lend still further encouragement to "original investigations in science, pure and applied"?

One of the most important problems discussed by President Schurman in his recent annual report is that of raising the standard of scholarship in the university. The very fact that the president has seen fit to raise this question in an official report indicates how serious the situation seems to him. For solving this difficult problem various means have been suggested, such as the establishment of scholarships, prizes, honor courses and the like. Each of these will doubtless be effective, but no one of them can be considered a cure-all. Any solution must be based upon the fundamental object of a university course, which, I take it, is *not* to make of a student in four years a walking encyclopedia, but rather to teach him a *few* facts, and in four years, to inspire in him such habits of study and scholarship as will make him a student for the rest of his life, whether his field be philosophy or engineering, so that his *real* studies will begin, not end, on commencement day. For, that man is successful in the practise of his profession who, in his college course or elsewhere, has gained confidence in his ability to undertake and accomplish successfully things which are new to him and which very likely have never been done before. The man who lacks this confidence, one might even say habit, of independent thinking, is likely to become a mere clerk or mechanic and to stay at the bottom of the ladder.

Now, you may teach facts and the relation of one group of facts to another—all that part of knowledge which we may classify as encyclopedic—but, try as you may, you can not teach by aid of any sort of artificial stimuli, life-long habits of study and of independent thought. These can come only *by inspiration and example,* for both of which the student must look, indeed it is his right to look, to the faculty, if he is to get full value from the four years of his time which he spends here. Or, looking at the university as an economic unit in society, *we can not expect to turn out a productive student body from a comparatively non-productive faculty,* non-productive not so much because of lack of interest in scholarship and research as because of lack of opportunity.

One of the properties of matter is that which we call inertia, by virtue of which a body at rest remains at rest unless acted on by some outside force, or if in motion remains in motion unless brought to rest by some outside force. The application of this principle extends, at least in a qualitative way, far outside the realm of material things. In our ordinary, every-day life we call it habit. It takes force, of one kind or another to make habits and it certainly takes force to break them.

It was probably in unconscious recognition of this principle that the remark was made some time ago, that while it might be true that students would study if interested, it was also true that in order to become interested they must be made to study. Because of the inertia of the human intellect, this probably applies, more or less, to all of us, *to the faculty* as well as to the students. If therefore, we would have a scholarly, productive faculty, by means of which to turn out a productive

student body, it follows that we must first *require* productive scholarship of the faculty *as a part of its duty to the university.* The interest in original work, thus aroused by compulsion if you will, will be self-sustaining and will accomplish the double purpose of setting an example to the students, by means of which, I firmly believe, many of our problems of undergraduate teaching will be solved, and of accomplishing that other prime function of any real modern university: the adding to the sum-total of knowledge.

Now, I would not presume for a moment, to suggest what alterations in the educational and the financial policies of the university may be necessary to bring about this much-to-be-desired condition, nor would I attempt to outline what part Sigma Xi may play in ensuring an increased recognition of the value to the student body, to the faculty, to the country, of more original investigations "in science, pure and applied." But what I do wish to point out is that here is a problem, right in our midst, which touches the very foundations upon which Sigma Xi is built, and to ask whether it is not our duty, officially as a society, to lend our organization, our ideals and our traditions "to encourage higher attainments among the future students of Cornell University." If we really believe in that for which the society stands, I regard it our duty to take an active part in the solution of this problem.

Coming now to an extension of the activities of the national organization, may I mention briefly two items already under consideration.

First, an extension of the chapter roll: For many years the society has exercised the greatest care in the admission of new chapters—this, without doubt, being due to the early experiences above mentioned, of the parent chapter. It has been felt that any institution, before being granted a charter, should have demonstrated beyond any doubt, its ability to maintain a high standard of scientific work. Now, however, with the increasing strength and stability of the society, we feel that, even though there may be a small risk involved, it is safe to go a step farther by granting charters to such smaller institutions as may have given distinct promise of creditable research activity. We may therefore expect a considerable increase in the chapter roll in the next few years.

Second, Sigma Xi fellowships: It has always been a matter of regret that neither the chapters nor the national society could directly engage in research. However, under the able leadership of our national president, Professor Stieglitz, of the University of Chicago, a movement has been started to enlist the support of the 12,000 members of the society, by asking for annual contributions from each member of say one or two dollars, for the establishment of at least two fellowships (more if possible) of a value of $1,500 or $2,000 each, one in the physical sciences and one in the biological sciences; these to be awarded each year on some sort of a competitive basis. The value of these fellowships would lie not so much in the satisfaction that we would feel in actually engaging in research, as in increasing the stability of the national organization by furnishing some tangible thing around which would center a common interest. At present the problems of the several chapters are so largely local and so little national that there is need for something to bring them closer together.

This movement at once suggests an obvious, though perhaps a radical change in our past procedure. When Sigma Xi was founded it was perfectly natural that its activities should be confined almost exclusively to university centers. Then the university *was* the home of pure science, and to a large extent of applied science. But now, due in part to the increasing economic importance of scientific work, and in part to the extent to which teaching duties are allowed to encroach on the time of the professor, conditions have radically changed. You have only to glance over the papers presented at the meetings of the scientific societies to realize that more and more research in pure science is coming as a by-product from the ever increasing number of governmental and industrial re-

search laboratories, on such a scale as to overshadow the output of the universities. And as for applied science, I need only mention a few recent developments, from one field, namely physics; such as: the tungsten lamp, which is worth annually to the country a sum expressed in hundreds of millions; the thermionin X-ray tube, which in addition to revolutionizing some phases of medical practise, has given to the investigator in pure science an instrument of research the value of which can hardly be overestimated; the wireless telephone, the beginnings of which as a factor in our economic life we have not yet begun to appreciate; multiplex telegraphy and telephony, by which many messages, part telephone and part telegraph, may be sent simultaneously over the same pair of wires with a consequent reduction in the cost of operation; improvements in the methods of maintaining, measuring and recording high temperatures, so important in many industrial processes; the high potential kenotron, a device which will probably clear Pittsburgh and every other city of its cloud of black smoke; a clearer understanding of the requirements of the human eye in the matter of artificial illumination; these, and countless other devices, all coming from outside of universities, may well raise the question as to whether we can *now* say that the university is the home of science, either pure or applied. If the university *is* the home of science, then it must be said that science is a large part of the time away from home, and even when at home occupies only a corner of the attic. If the universities would keep science *at* home they must provide the main suite on the first floor.

In other words, looking at it from whatever standpoint you please, it is certainly true that pure science as well as applied science has outgrown the universities. Unless therefore we wish to apply a purely arbitrary definition to "original investigations in science" we must extend the active influence of Sigma Xi beyond university centers. The fact that the investigator in applied science is given equal recognition with the investigator in pure science at once indicates that the society raises no questions as to what use shall be made of the results of the investigation. It should likewise make no difference where the work is performed, whether in a government laboratory, an industrial laboratory or a university laboratory, so long only as the investigator is sincerely looking for "the truth."

So far as formalities are concerned, this extension can be very simply made, for it is only necessary to make active members the ten thousand (approximately) non-active members, who collectively represent practically every industry, and every educational institution in the country. We would then have available adequate machinery for spreading the society's ideals so as to cover the whole field of science, and not simply that portion of it which is found in universities. To do this seems to me not simply a duty which we owe to our alumni members, but an opportunity to extend our sphere of influence—an opportunity, the neglect of which would be an unpardonable waste of our "natural resources."

But it might be asked: what can we do with 12,000 members scattered throughout the country which is not being done by the several engineering and scientific societies. There is this difference: These, in the main are at work advancing knowledge in their respective fields. Sigma Xi, however, includes all science; and could undertake common problems such as, for example, a campaign to increase the popular appreciation of the value of scientific research. Such a campaign would have to be carried on in a very dignified, judicious way, but I believe there is need for it. It is one way to express the contribution of Sigma Xi up to the present by saying that the society has attempted to make science appreciated by scientists. The next logical step is to make science appreciated by those who are *not* scientists: to correct the popular impression that it is only necessary for some inventor to conceive a new idea, and behold, a wonderful new invention, such as the wireless telephone, springs full grown as from the head of Zeus; to point out the tireless research be-

hind such a device as this and that it is the people of the country in the long run who profit by the work of the investigator; and that such work is worthy of more stable support than the chance generosity of some multimillionaire. From an economic standpoint scientific research is a well-established business, not the mere whim of a few individuals; a business involving perhaps a long-term investment but which nevertheless is just as worthy of support, and economically just as important, as is the postoffice department or the railroads, differing from these only in the fact that these supply the present generation while scientific research, like the public schools, is for the next.

Whether we shall see government support of research in pure science depends, I believe, only on whether the scientific societies of the country, of which Sigma Xi is as representative and potentially as influential as any, can agree upon and present to Congress a concrete statement of the responsibilities of the federal government in this matter as well as a workable plan for administering such support. In a democratic country it seems impossible that ever again should it be left to accidental philanthropy to provide funds for building the very foundations of economic and industrial progress.

Of the possibilities of making the influence of Sigma Xi international, little need be said except in amplification of the statement that even now the matter is under informal consideration and will probably come before the society for formal action some time within the next two years, in response to inquiries from two foreign countries, England and Norway. The sentiment of the society, so far as voiced, is in favor of such an extension, and there seems to be nothing either in our constitution or our traditions which prevents. May we not look forward therefore with much hope to an international fraternity of scientific workers, the influence of which, even though sentimental rather than scientific, will serve as one additional bond to tie together that which we all hope to see some day: a great family of nations. F. K. RICHTMYER

CORNELL UNIVERSITY

ZOOLOGICAL AIMS AND OPPORTUNITIES

IN its recent numbers SCIENCE has printed two addresses made before the Baltimore meeting of the American Association for the Advancement of Science last winter, both of which deal with the same general subject; the aims and purposes which in the present critical period of the world's history should guide or influence zoological and botanical work, and the opportunities offered and responsibilities imposed by the present conditions on those engaged in such work.

Both of the addresses contain much that is interesting and inspiring and make suggestions that are well worth trying out, but neither of the two speakers seems to have felt it necessary to extend his survey of the field beyond the two subjects of teaching and research, though of course including under the latter heading investigation for practical and economic purposes as well as for the increase of knowledge without immediate prospect of its application. This limited conception of their proper aims and obligations is unfortunately held by a large proportion of scientific workers, probably more often because it falls in with their inclinations and convenience than because of any conviction of its sufficiency; it may have answered well enough in the earlier stages of the development of science and may still do so in some departments of it, but it is now very far from sufficient in the case of zoology, botany, ecology, forestry and other allied branches. The rapid economic expansion of the present time is making demands on natural resources to an extent that was never before approached, and improved and quicker means of transportation are extending the resulting destructive effects to every part of the world. Only prompt and scientifically directed effort can save from complete and permanent destruction and disappearance a large part, and perhaps much of the most interesting part, of the subject matter with which these sciences deal. It is only those with more or less scientific knowledge of animals and plants who can see in advance the need of protective or remedial measures and

can direct and carry them out with any hope of success. It therefore seems as if the speakers themselves missed an important opportunity and failed in an even more important responsibility in addressing such audiences as were gathered in Baltimore, and the vastly larger circle that is reached when the addresses are published, without a word, and apparently even without a thought, of what might and ought to be done by scientific men for the preservation from extinction or destruction of the hundreds of interesting species of animals and plants and the many places of unusual scientific interest that are being sacrificed for the selfish interests of a few, or even merely by neglect and indifference, with resulting advantage to nobody.

Obstruction of important conservation measures until everything that they were designed to protect has been made away with, and laws and efforts that fail of their purpose because unwisely directed or inefficiently carried out, would not be so frequent were it not for the easy-going indifference and irresponsibility of those who are the only ones who can fully realize the needs and urgency of the situation, and who should therefore feel it a duty to make others understand also. We may be shocked and indignant at the vandalism of the Huns of ancient and modern times in respect to works of art and the results of human industry, but we ourselves act no better toward natural objects of unique interest, value and beauty, and more intelligent generations in the future who will find themselves deprived of much that it was our duty to preserve for them will no doubt regard us with the same kind of feeling as we look upon the despoilers of Belgium, France and Serbia. Yet there are few scientific men who concern themselves with such matters to any extent greater than occasional expressions of regret; sentiments which would seem more sincere if accompanied by some effort to assist the small minority who do take up the burden of active work to bring about a better order of things. One often can not help wondering whether zoologists, botanists and foresters do not as a class care less about the living things they occupy themselves with than most other people. If they are not to be open to such an accusation, now that the war is over and a period of economic expansion begun that will be even more destructive to the small part of the world that still remains in what we call for lack of a better term its natural state, there should be no delay in starting more extensive and efficient cooperative work on the part of scientific men and societies for the preservation of those natural objects of scientific interest and those species of animals and plants that are most immediately threatened with extinction or annihilation.

Very few scientific societies or institutions have any committee or representative with the duty of engaging in such work or cooperating with others in it, or of watching out that those to whom such work is intrusted by the government or by societies supported by private subscription are doing their work as diligently and as effectively as the means available will permit. Many more should have them than is now the case. The need is so urgent and immediate that a share of the responsibility now extends to many associations and institutions whose main aims and purposes lie so much in other directions that under ordinary conditions they could justly claim that to devote means and efforts for such purposes would be outside of their proper duties. But emergencies impose new obligations, and however unwelcome they may be, if they are shirked the result can only be discredit and regret after it is too late for any remedy.

No one should delude himself with the idea that because there are in this country certain societies for the protection of birds and animals or because the federal government has at length begun to take a small part in it, that there is nothing more to be done by others. One might suppose that after over twenty years of agitation of the matter, and after abundant evidence of much interest on the part of the general public, that our native North American birds would now be receiving proper protection, but at the present time one of the most discreditable and inexcusable acts of

systematic vandalism that has ever occurred on this continent is being carried out at the public expense by the Alaskan territorial government, which in 1917 placed a bounty on eagles. In less than two years about five thousand six hundred of these birds, which must be of a large percentage of the entire number inhabiting North America, have been killed for fifty cents each, and the slaughter is still going on. From what is known of the habits of the bald eagle it can not be doubted that reports of its depredations have been grossly exaggerated, and that an impartial scientific investigation would prove that much persecution that it is suffering is both unnecessary and unjustified.

Places in North America outside of Alaska and some of the neighboring British territories where eagles can still safely breed are now very few; they rarely successfully raise more than one or two young in one brood, and the growth of the young birds is slow, so that the same pair can not raise young every year. Eagles are naturally very long-lived birds and a large part of those now living were raised many years ago when conditions for breeding were more favorable, and at best the birds would not be able to maintain even the present small numbers still existing under the conditions now prevailing. It is evident that such destruction as that which is going on in the only part of the continent where these birds are still numerous has already advanced a long way toward adding our national emblem to the list containing the Labrador duck, the passenger pigeon, the whooping crane, the trumpeter swan, the Carolina paroquet and others that have now disappeared forever. With more active interest on the part of those with scientific knowledge, the passenger pigeon might not have become extinct, since it might have been preserved by the simple expedient of protecting its breeding places; the few remaining individuals of the heath hen would not have been allowed to remain where a single forest fire could wipe them practically all out; the small remaining colonies of the California sea elephant found a few years ago might not have been left without protection, and the golden plover, which is on the verge of extinction, would not be especially excepted from protection by the present federal migratory bird law. With more scientific and intelligent judgment applied to such matters the Klamath lakes, which are among the most important remaining breeding places for wild fowl in the United States, would not now be being drained; and many other mistakes or worse than mistakes might have been avoided, or in some cases might even still be corrected.

The particular purpose of this communication is however to call attention to one phase of protective work which is very important for science, and in which scientific men and societies must especially interest themselves if it is to be taken up at all, for the general public can not be expected to appreciate its importance. This is the protection of what remains of the unique and peculiar forms of animal and plant life that inhabit many of the remote islands and isolated island groups in various parts of the world. These contain many species of birds, animals and plants peculiar to themselves, and represented, on account of the small area they inhabit, only by few individuals. They are thus very likely to disappear, either through changes caused by, or direct destruction by man or by noxious animals, as the mongoose, domestic cats and rats introduced by man. Hundreds of interesting island species, including birds, reptiles, insects, mollusks and members of other groups, have already become totally extinct through human agency, and many of the remaining ones are immediately threatened with the same fate. On such islands there usually were, and on many there still remain, forest tracts containing plants found nowhere else and presenting ecological conditions entirely unique and therefore of great scientific interest. If they could be preserved, which is desirable for their own sake, they would serve as reservations for preserving the native animals also. This would in many cases not be an expensive undertaking, as it is chiefly in land unfavorable in character or situation for agricultural purposes that such forests have been allowed to remain, and it is probable that

in some cases the local governments could be induced to set them aside as reservations if the reasons for it were made clear.

Such islands as those here referred to, do not however have a sufficient proportion of inhabitants with scientific interests and with the means or enterprise to take any effective steps toward preserving their native plants or animals, nor do they appreciate their unique character, or fully realize that the things they see about them all the time are found nowhere else in the world. The initiative, encouragement, and no doubt some money (it would in many cases not take a great deal) must come from outside. This is not a matter of local interest only, it concerns nature students, zoologists, botanists and foresters throughout the world, particularly those interested in these sciences from an ecological point of view.

There never has been a time when international jealousies and mistrust and obstinate conservatism have so nearly disappeared from among the nations holding colonial possessions as they have to-day. The international cooperation of scientific societies and of the local and general governments necessary to carry on such work is not nearly so far outside the range of probability now as it would have seemed a few years ago. It seems a favorable time for some of our larger and more influential scientific associations and institutions to make a beginning by the appointment of a committee to communicate with others that might be interested, and discover what support and encouragement such a movement could hope for. The need is urgent, every year's delay will increase the difficulty and greatly diminish the results that it will be possible to achieve.

Willard G. Van Name

SCIENTIFIC EVENTS

THE ANTHROPOLOGICAL SOCIETY OF PHILADELPHIA

An article in the *Pennsylvania Gazette* reports that for the past ten years a small group of men, interested in some aspects of anthropology, have held meetings (informal at first, before 1914) for the interchange of ideas and the stimulation of interest. The nucleus of this group was certain members of the faculty of the University of Pennsylvania and of the staff of the university museum, whose work lay in this field. The remainder were students and "laymen" who had some interest in anthropological studies, and who served to leaven the whole and widen the usefulness of associating together.

In the beginning no attempt was made to keep any definite object in view nor to expect anything more than that sociability would grow out of these gatherings. But when a man came home, after a bit of interesting field-work, one of the first things he did was to look up the next meeting of his friends and co-workers, to talk over his trip and perhaps to display photographs and specimens. In this way there arose evening meetings devoted to particular topics, with "speakers," meetings which were informal, but which tended toward a definite purpose. The café in which these friends usually met gradually became a sort of headquarters for the entertainment of anthropologists, visiting field-workers and members of societies from other cities.

In March, 1914, a serious attempt was made to increase the usefulness of these informal gatherings by adopting a regular date and place of meeting. The first step in this direction was to elect a president, a secretary-treasurer and an executive committee. Thus formed, and under the name of The Anthropological Society of Philadelphia, those interested began to hold regular meetings and to hear prepared papers and discussions once each month during the winter. The social character of the meetings was kept as much as possible and all formality was avoided, just sufficient, indeed, to preserve a natural cohesion of interest and companionship.

During the past three years funds have been appropriated by the provost through Dean Ames, of the university to pay the expenses of non-resident speakers to address the students of the department of anthropology; permission was obtained, through the efforts of Professor Frank G. Speach, of the department,

to combine the meetings of students and members of the society for mutual benefit. This arrangement has enabled the society to entertain some of the foremost anthropologists of the country, keeping the members in touch with the important work being done in other university centers, and making this body the center of things anthropological in Philadelphia.

At the first formal meeting of the society in 1914, Professor W. Max Müller, the Egyptologist, was elected president for the current four years. The president for the current year is Professor Walter Woodburn Hyde, of the department of Greek. Professor Speck, of the department of anthropology, has been an active member of the executive committee from the beginning, contributing largely to the success of the society.

Among the outside speakers who addressed the society in the past two seasons were:

Dr. Robert H. Lowie, curator of ethnology, American Museum of Natural History, New York. (Two papers.)

Dr. Alexander A. Goldenweiser, Columbia University. (Two papers.)

Professor Franz Boas, head of the department of anthropology, Columbia University.

Professor Alfred L. Kroeber, head of the department of anthropology, University of California.

Professor Spencer Trotter, department of biology, Swarthmore College.

Professor Phineas W. Whiting, department of biology, Franklin and Marshall College.

Honorable Gifford Pinchot, formerly chief forester of the U. S.

THE BRITISH NATIONAL PHYSICAL LABORATORY

THE custom which held before the war of inviting a number of visitors to the National Physical Laboratory in June has had to be suspended during the last four years, but it was revived on June 24 on the occasion of the annual inspection by the general board, the chairman of which, Sir J. J. Thomson, O.M., received the guests.

The London *Times* states that those who had not seen the laboratory since the war could scarcely recognize the place, so numerous are the extensions that have been made, and yet the accommodation is even now inadequate for the work that has to be done. Perhaps the most conspicuous of the additions is a new aeronautics building which, among other things, is to house a huge wind channel, 14 feet across, for the testing of aircraft models.

Arrangements had been made by the director, Sir Richard Glazebrook, who is retiring in September, for conducting the visitors over the laboratory, and numerous demonstrations illustrating the work that is being carried on in the various departments had been arranged for their edification. Thus, in the metallurgy department the new rolling mill was shown in operation rolling high-tensile aluminium alloys down to very thin sheets suitable for covering the wings of aeroplanes in place of fabric. In the existing wind channels of the aeronautics department experiments were being conducted on the balancing of airship rudders, the mutual interference of airscrew and body and the flow of air in the neighborhood of the airscrew, the spinning of aeroplanes, and other points. The William Froude National Tank was being employed for the testing of seaplane floats, some of the experiments relating to the resistance, running angle and longitudinal stability of the float while planing on the water, and others to the impact of a seaplane when alighting on water. In the metrology department various munitions gauges, in the supply of which the laboratory did such good work during the war, were on view, and there was a minimeter capable of registering differences of one millionth of an inch. An electrical device for indicating at a distance the depth of petrol in the tanks of an aeroplane was to be seen, and in the department of electrotechnics there was the Paterson-Walsh electrical apparatus which was used as part of the London air defenses for ascertaining the height of hostile aircraft, while experiments with wireless telegraphy were conducted in a hut in the meadow. The engineering department and the optics division of the physics department were also open among other sections.

THE NEW BRITISH ANTARCTIC EXPEDITION

MR. J. L. COPE, who is organizing and will lead the British Imperial Antarctic Expedi-

tion which is to sail next June, and will be absent about six years, is shortly leaving England for Canada to make arrangements for the bringing to this country for the necessary fitting up of the *Terra Nova,* which has been secured for the venture.

Mr. Cope is at present engaged in appointing the personnel of the expedition. Professor R. C. Mossman, who has been appointed chief of the scientific staff, was meteorologist to the Scott Antarctic Expedition; Mr. A. H. Larkman, who sailed in the *Terra Nova* as chief engineer with the Shackleton Expedition, has signed on with the British Imperial in the same capacity; and Mr. T. H. R. Hooke, R.A.F., who was also with the Shackleton Expedition, has been appointed chief of the wireless staff. Captain Hurley, who during the war was one of the official photographers to the Australian forces and who accompanied the Mawson Expedition as photographer, will go with Mr. Cope as photographer. A cable has been received by Mr. Cope from Mr. Ernest Joyce, who was a member of the Scott and Shackleton expeditions. It is probable that Mr. Joyce will accompany the present expedition, and in the meanwhile he is in charge of the organization in Australia. Lieutenant E. Healy, late Dublin Fusiliers, has been appointed a member of the shore party, which will leave the *Terra Nova* when the vessel becomes fast in the ice, and will explore the district to the south of the great ice barrier.

It is the intention of Mr. Cope to take an aeroplane on board the *Terra Nova* and make a flight to the South Pole. Already two firms of aeroplane makers have offered to supply the expedition with a machine free of cost. Generous support is being given the expedition by commercial firms.

DISTINGUISHED SERVICE MEDALS

The distinguished service medal has been awarded as follows: Colonel William H. Welch, United States Army. For exceptionally meritorious and conspicuous service. From his rich experience in scientific medicine, sanitation, public health and medical education he helped materially in guiding the medical profession both in and out of the Army safely through many difficulties of war. Colonel Victor C. Vaughan, United States Army. For exceptionally meritorious and conspicuous service. During his service in the office of the surgeon-general his contributions of advice and information have been of great value to the Army in connection with the control of communicable diseases. During the recent epidemic of influenza, in particular, his work was of extreme value. Lieutenant-Colonel Richard P. Strong, Medical Corps, United States Army. For exceptionally meritorious and distinguished services. Possessed of the highest professional qualification and actuated by zealous devotion to duty, he has rendered service of inestimable value to the American Expeditionary Forces, notably as president of a board appointed to investigate the cause of trench fever, a disease which has caused serious losses to the effectives of the allied armies. The scientific research of this board under his skilful direction led to the discovery of the means by which trench fever is transmitted and in the establishment of effective measures for its prevention.

SCIENTIFIC NOTES AND NEWS

Dr. Christopher Addison has been appointed the first minister of health in the Ministry of Health which has been established by the British Parliament. Dr. Addison was at one time professor of anatomy, University College, Sheffield. He was parliamentary secretary to the Board of Education, 1914–15, minister of munitions, 1916–17; minister of reconstruction, 1917, and has latterly occupied the office of president of the Local Government Board.

Professor F. Soddy has been elected a foreign member of the Swedish Academy of Sciences in succession to the late Sir William Crookes.

Dr. Chas. B. Davenport, of the Carnegie Institution of Washington, has been elected associate of the Académie des Sciences de Belgique.

Dr. Henry G. Barbour, assistant professor of pharmacology in Yale University, has received a grant of $200 from the committee on

Scientific Research of the American Medical Association for the investigation of substances likely to be of value as anesthetics.

DON C. MOTE, formerly economic zoologist, Ohio Agricultural Experiment Station, has been appointed state entomologist of Arizona by the Arizona Commission of Agriculture and Horticulture, and assumed the duties of the office on July 1.

DR. A. G. MCCALL has terminated his services with the Army Educational Corps in France and has resumed his work as chief of the Soil Investigational Work at the Maryland Experiment Station.

MR. HARRY S. MORK has resigned as vice-president of Arthur D. Little, Inc., of Cambridge, Mass., and has been elected to the vice-presidency of the Lustron Company of Boston, manufacturers of artificial silk by a process developed in the Little establishment. He will also act as consultant to the Industrial Company of Boston.

DR. MAURICE H. GIVENS has resigned the assistant professorship of biological chemistry at the University of Rochester to accept the post of biochemist in the research laboratory at the Western Pennsylvania Hospital, Pittsburgh, Pa.

THE council of the British Scientific Instrument Research Association has appointed Mr. H. Moore to be assistant director of research.

THE American Scandinavian Foundation announces the names of ten American college students who will receive $1,000 each to enable them to go to Sweden to study in exchange with ten Swedish students to come to America. The men appointed are: Samuel G. Frantz, Princeton; Harry F. Yancey, University of Missouri; Chester C. Stewart, Massachusetts Institute of Technology; Harry W. Titus, University of Wyoming; Robert C. Sessions, Worcester Polytechnic Institute; Clarence N. Ostergren, Sheffield Scientific School; William S. Moir, Yale Forestry School; Henry M. Meloney, State School of Forestry at Syracuse University; Rudolph E. Zetterstrand, Sheffield Scientific School, and Thomas Fraser, University of Illinois.

ON July 1, Major Clarence J. West, recently in charge of the editorial department, Research Division, Chemical Warfare Service, assumed his duties as director of the information department of Arthur D. Little, Inc. In his new position Major West will extend the library facilities of the organization and develop a special information service on technical and scientific subjects for the benefit of the clients and staff of Arthur D. Little, Inc.

COLONEL HARRY L. GILCHRIST, of the Medical Corps, U. S. A., will command a group of 550 American Army officers and volunteers who will undertake to eliminate typhus from the camps and among the people in Poland.

PROFESSOR ALBERT JOHANNSEN, of the University of Chicago, has gone to Mexico City for the summer. He is doing petrographic work for the Mexican Survey.

MR. I. H. BOAS, M.Sc., of the Technical School, Perth, has left for Europe, America and India, where he will investigate Forest Products Laboratories. His report will form the basis of the Western Australian project.

PROFESSOR H. F. CLELLAND, of the department of geology, has been granted a leave of absence from Williams College for the coming college year.

DR. J. G. SANDERS, director of the Bureau of Plant Industry of the Pennsylvania Department of Agriculture, at Harrisburg, Pa., has been commissioned by the Federal Horticultural Board at Washington to study the potato wart disease in the Briish Isles, and to note the methods adopted for controlling the spread of this most dangerous potato disease. The potato wart disease was first determined by him to occur in the United States in a district comprising four counties in the vicinity of Hazleton, Pa., in September, 1918. These four counties, with three outlying points, are now under strict quarantine.

ORGANIZED from the Scottish Oceanographical Laboratory, a surveying expedition left Edinburgh on June 16, for Spitsbergen, headed by Mr. John Mathieson, late divisional superintendent of Ordnance Survey in Scotland, who retired to take up this work. In

1909 Mr. Mathieson completed a survey of Prince Charles Foreland, Spitsbergen, which was begun in 1906 by Dr. W. S. Bruce, director of the Scottish Oceanographical Laboratory.

In connection with the physiology of the nervous system, given as a part of the course in general physiology at the Tufts College medical school, a series of three lectures was delivered on July 21, 22 and 23, by A. P. Weiss, of the department of psychology of Ohio State University, on "The place of behavior psychology in physiology."

The following lecturers at the Royal College of Physicians of London are announced: Dr. J. L. Birley, the Goulstonian; Sir W. Leishman, the Horace Dobell; Sir J. Rose Bralford, the Lumleian; and, for 1921, Dr. J. L. Golla, the Croonian.

The death is announced at the age of sixty-seven years of Dr. Emil Fischer, professor of chemistry in the University of Berlin. Dr. Fischer was awarded a Nobel prize in 1902.

Included in the Army Appropriation Bill, now passed by Congress, is an appropriation of $20,000 for the Surgeon-General's Library, and for the preservation of specimens for the Army Medical School, Washington, $10,000. An appropriation of $350,000 is made for the purchase of twenty-six acres of land adjoining Walter Reed Hospital, Washington, for the final location of the Army Medical School, Surgeon-General's Library and the Army Museum, and for the improvements on the land to be purchased.

The thirteenth annual meeting of the British Museums Association was held at Oxford, on July 8, and the two following days. Members were welcomed by Sir Herbert Warren, president of Magdalen. An address was given by the president, Sir H. Howarth, followed by the reading of a series of papers on museums in Oxford. Wednesday morning was occupied by discussions on the propriety of transferring the control of museums to the education authority, and on various matters of detail. On Thursday Dr. W. Evans Hoyle, curator of the Welsh Museum, Dr. F. A. Bather, of the Natural History Museum, and Mr. Isaac Williams, of Cardiff opened a discussion on the desirability of establishing a diploma for museum curators, and on the course of training that should be required. In the afternoon visits were paid to local museums and places of historic interest.

We learn from the London *Times* that the fifth annual general meeting of the Medico-Political Union was held in London on June 12. Dr. F. Coke, in his presidential address, said that 367 new members had joined during the last month. The report of the general secretary regretted the hostility which had sprung up between the British Medical Association and the Union. "The Association had for many years," the report proceeded, "while decrying trade unionism, been employing trade-union methods with impunity, until the Coventry case shattered their claims and left us as the only body adequately equipped to carry on a fight on behalf of the profession. I am pleased to say that the association, or certain of its members, recognize facts, and an attempt is now being made to reconcile differences." As to the formation of a ministry of health, the report stated that it foreshadowed drastic changes in the medical services at an early date. Those changes would benefit neither the community nor the profession, unless the latter had a large voice in shaping them. It was the duty of that union to impress on government departments the importance of the general practitioner as the backbone of the medical profession, and the fact that he was better equipped to give advice than those occupying a more exalted position. Resolutions were also passed in favor of the organization of the whole of the medical profession on a trade-union basis, and to the effect that a whole-time salaried service for general practitioners was undesirable.

UNIVERSITY AND EDUCATIONAL NEWS

The contract has just been signed for an addition to the laboratory of the department

of chemistry of the Rensselaer Polytechnic Institute to cost $175,000. The new wing will be devoted to laboratories for quantitative analysis, organic chemistry and physical chemistry. The new construction is necessary because of the growth in the number of students taking the courses in chemical engineering and general science.

DR. E. J. KRAUS, dean of service departments at the Oregon Agricultural College, has been appointed professor of applied botany at the University of Wisconsin.

PROFESSOR ALFRED ATKINSON, professor of agronomy in the Montana State College, succeeds President J. M. Hamilton, who has retired after serving for fifteen years.

MAJOR HENRY A. MATTILL, Sanitary Corps, formerly assistant professor of nutrition at the University of California, returned early in March from France, where he had charge of instruction in food and nutrition in the army schools at Langres. Dr. Mattill has accepted a junior professorship in biological chemistry at the University of Rochester.

DR. V. BUSH, now engineer of the American Radio and Research Co., has been appointed associate professor of electrical engineering at the Massachusetts Institute of Technology.

THE following promotions at Lehigh University have been announced: Assistant Professor R. L. Charles, physics, to become associate professor; Mr. P. B. Fraim, physics, assistant professor; Mr. J. S. Beamensderfer, mechanical engineering, assistant professor; Mr. H. C. Payrow, civil engineering, assistant professor, and Mr. M. S. Knebelman, mathematics, assistant professor.

AT Cambridge University Mr. W. E. Dixon, Downing College, has been appointed reader in pharmacology; Mr. J. E. Purvis, Corpus College, university lecturer in chemistry and physics in their application to hygiene and preventive medicine; Dr. Graham-Smith, university lecturer in hygiene, and Mr. T. S. P. Strangeways, St. John's, university lecturer in special pathology.

DISCUSSION AND CORRESPONDENCE

LIMICOLOUS OLIGOCHÆTA FOR LABORATORY USE

TO THE EDITOR OF SCIENCE: I should like to bring to the attention of teaching zoologists the advantages of living limicolous oligochæta, preferably a *Tubifex* or a *Limnodrilus*, for laboratory purposes in connection with exercises on the earthworm. In the movement which is developing in elementary courses to get away from mere study of structure, the introduction of some convenient and usable form for demonstrating functional activity in connection with so important a type as the earthworm is desirable. At Ohio State University we have used *Limnodrilus* with success. It is sufficiently transparent to allow the internal structures and processes of the annelid body to be observed. The entire alimentary tract is visible and the peristaltic action of the intestine can be demonstrated together with the effect this has on the material in the intestine. Frequently, too, it is possible to see the movements of the pharynx during ingestion. The contraction and the direction of blood flow in the main blood vessels can be observed. The movement of the setæ and their connection with the muscles operating them are also to be seen. The relation of the septa to body wall and intestine and the division of the cœlom into compartments is clearly apparent. It will thus be seen that these worms not only illustrate the annelid body, but also demonstrate functions of general application.

For laboratory use it is best to anesthetize the worms to the point of immobility. They should be placed in a watch glass partly filled with water and to this should be added a few drops of a saturated solution of chloretone. It is best to use a little at first, allow it to work for a while and then if necessary add more. The dish should be covered. With a little practise it is possible to have the worms immobile and yet keep the blood vessels and intestine active. For demonstrating ingestion and movement of the setæ no anesthetic should be used. Of course all activities are at their best in the unanesthetized worm if students have time and patience to follow the speci-

men. A binocular microscope or a .40-mm. lens on a compound instrument should be used. The worms are usually to be found in the bottom of almost any body of water where there is mud mixed with decayed vegetation. They can be kept indefinitely in aquaria having a layer of mud on the bottom.

F. H. Krecker

Ohio State University

THE CUMBERLAND FALLS METEORITE

The stone described by Professor A. M. Miller in Science for June 6 of the present year, and of which the National Museum has secured the major portion, proves of exceptional interest. In fact, it is scarcely too much to say that it is one of the most remarkable falls yet reported on the American continent. The stone is a coarse enstatite breccia, closely compacted, showing evidences of compression while under a considerable load and other indications of its having formed a portion of a body of considerable size, even of planetary dimensions. The most striking macroscopical features aside from its brecciated structure are the occasional enclosures sometimes 4 or 5 cm. in diameter, of a dark, nearly black, chondritic stone. I do not recall another instance of so plain an admixture of stones of quite different type. Such a stone finds no exact position in the classification of Brezina. Following out the general plan, however, I have made a place for it among the achondrites and designated it a *Whitleyite*—a magnesia-rich stone brecciated in structure, consisting essentially of enstatite, poor in iron and carrying enclosures of a black chondrite. The results of further studies will be published elsewhere.

Geo. P. Merrill

U. S. National Museum,
Washington, D. C.,
June 20, 1919

THE THIRD EDITION OF THE BIOGRAPHICAL DIRECTORY OF THE AMERICAN MEN OF SCIENCE

The compilation and publication of the third edition of the *Biographical Directory of American Men of Science*, postponed on account of war conditions, will now be completed as rapidly as possible. The work is intended to be a contribution to the organization of science in America, and the editor will greatly appreciate the assistance of scientific men in making its contents accurate and complete. Those whose biographies appear in the second edition are requested to forward such alterations and additions as may be necessary or desirable, and to obtain biographical sketches from those who should be included or send their names and addresses. All those engaged in scientific work whose biographies are not included in the second edition are requested to send the information needed. For this purpose the blank that is given on an advertising page (ii) of the current issue of Science may be used.

It is intended that each entry shall contain information as follows:

1. The full name with title and mail address, the part of the name ordinarily omitted in correspondence being in parentheses.
2. The department of investigation given in italics.
3. The place and date of birth, including month and day.
4. Education and degrees, including honorary degrees.
5. Positions with dates, the present position being given in italics.
6. Temporary and minor positions; scientific awards and honors.
7. Membership in scientific societies with offices held.
8. Chief subjects in which research has been published or is now in progress.

All those in North America should be included in the book who have made contributions to the natural and exact sciences. The standards are expected to be about the same as those of fellowship in the American Association for the Advancement of Science or membership in the national scientific societies which require research work as a qualification.

The compilation of the new edition will of necessity involve much labor, but this will be materially lightened if men of science will reply promptly to this request.

J. McKeen Cattell

Garrison-on-Hudson, N. Y.

SCIENTIFIC BOOKS

The Indigenous Land Mammals of Porto Rico, Living and Extinct, Memoirs of the American Museum of Natural History, N. S., II., Pt. II., October, 1918. By H. E. ANTHONY.

Captain Anthony has been very fortunate in being able to study a very interesting phase of mammalian evolution; the borderline between the extinct and the recent. This fact makes his excellent memoir extremely interesting to students of vertebrate evolution. The work was attempted as a phase of an extensive survey of Porto Rico, covering the recent fauna and flora, the authropology and archeology; Captain Anthony confining his attention to the mammals. Most of the fossil forms are of Pleistocene age, though their nature is such as to lead Dr. Matthew to suggest to the American Philosophical Society[1] that Porto Rico and its adjacent islands have not been in direct communication with the mainland since the early Pliocene. The great body of the monograph, illustrated by 55 text figures and 76 photographic plates, is devoted to the systematic descriptions of the forms, chiefly bats. A few amphibian and reptilian bones were also discovered but these have not been discussed. The reptilian bones seem to be lizards of the general type of *Amblyrhynchus,* because of the presence of epiphyses. Anthony concludes:

> Judging from the character of the ancient mammalia, it (the fauna) must have reached the present islands at approximately some time in the period from the Oligocene to the end of the Miocene. In the Miocene the fauna of South America was of very much the same general character as that of the ancient island fauna and in the light of present-day knowledge of South American paleontology the relationships of most of the island mammals undoubtedly run back to the South American Miocene formations.

The presence of two large ground sloths, *Acratocnus odontrigonus* and *A. major* which the author compares with South American *Hapalops* and *Eucholœops* is an indication of the relationship of the early South American fauna with that of Porto Rico. The osteology of these two ground sloths, so far as known, is carefully illustrated and described.

[1] SCIENCE, N. S., XLIX., 546, 1919.

ROY L. MOODIE

COLLEGE OF MEDICINE,
UNIVERSITY OF ILLINOIS,
CHICAGO

The Boys' Book of Chemistry. A Simple Explanation of Up-to-date Chemistry. Together with Many Easily Made Experiments. By CHARLES RAMSAY CLARKE. New York, E. P. Dutton & Company. 1918.

It is so obviously desirable that the youth of to-day should take a keen interest in chemical science, to which such prominence has been given in the war-time activities that one would welcome the appearance of a satisfactory book for boys' use. Unfortunately "The Boys' Book of Chemistry" is not only a disappointment, but it is one of the most pernicious little volumes that has appeared for a long time. The chemical statements are absolutely wrong in a considerable number of instances and misleading in many more, and the book is subject to severe criticism both as to its English and the arrangement of its subject matter. The degree of judgment shown in the selection of material is perhaps sufficiently indicated by the statement that in the chapter entitled Synthetic Chemistry for Beginners the first four syntheses are those of camphor, indigo, tannin and rubber; and these are given in mere outline form which is practically valueless to the reader, boy or man. At a time when books which will lead to an intelligent interest in chemistry are so desirable, it is unfortunate that this volume should appear to the confusion of its readers.

H. P. TALBOT

NOTES ON METEOROLOGY AND CLIMATOLOGY

METEOROLOGICAL ASPECTS OF TRANSATLANTIC FLIGHT

DURING the early preparations for the trans-Atlantic flight most of the discussion centered on the machines themselves, but when it became evident that airplanes and dirigibles could stay in the air long enough to accom-

plish the flight, the interest in the meteorological aspects became more manifest. And when aviators intending to fly across the Atlantic had to wait many weeks for favorable weather, the importance of the meteorological conditions became recognized as paramount.

"Trans-Atlantic flight from a meteorologist's point of view," was discussed in detail by Mr. W. R. Gregg, of the Weather Bureau, at a meeting of the Philosophical Society of Washington, March 29, 1919; and this paper was published widely during the first half of May.[1] In the selection of routes for trans-Atlantic flight, helpful winds as well as geographical distance must be considered. Thus, the best eastward routes are Newfoundland to Ireland and Newfoundland to the Azores and Portugal; while the best westward routes, so far as wind aid is concerned, are (1) Scotland to Labrador via Iceland and Greenland, (2) Portugal to the West Indies, and (3) Africa near Cape Verde, to eastern Brazil. Since eastward flight from Newfoundland offers the best initial possibilities for airplanes, Mr. Gregg confined his discussion to the weather conditions in the middle latitudes of the North Atlantic.

The temperatures in winter or summer are usually not extreme. The moisture of the air over the oceans is of importance only in its connection with fogginess, cloudiness and precipitation. The average cloudiness along the more northern route (Newfoundland to Ireland) is about 70 per cent., but this includes the thick fogs as well as the clouds. Fortunately, the aviator can generally rise above the clouds for observation, and over the sea, it is not so dangerous to fly below low clouds as it is over the land. Rainfall occurs very frequently, *i. e.*, on about two thirds of the days—but, here again, it is possible for the aviator to fly high and thus to avoid the heaviest rain. Fog, while a grave danger in trying to land, or in flying low, usually does not extend high. On the Grand Banks fogs occur on about 60 per cent. of the days in summer and 20 to 35 per cent. of those in winter; on the Irish coast the percentages are 10 and 5, respectively. Since these fogs do not usually extend very far inland, they seldom would prevent landing. The vertical extent of the Newfoundland fogs is almost always less than 250 meters, and so can easily be left below the flier at the start.

The general pressure distribution and winds favor eastward flight, though the frequency of gales is unfavorable, gales occurring on about 25 per cent. of the days in winter and 5 in summer on the Newfoundland to Ireland route, and slightly less often on the Newfoundland to the Azores and Portugal route. Tropical cyclones, fortunately, are rare. The conditions in the free air are not very different from those on the surface, for over the ocean the wind increases and turns but little with altitude, the surface friction being very small relative to that over the land.

While the average conditions are generally favorable for eastward flight in middle latitudes across the North Atlantic, the actual conditions at a particular time are those which must be encountered. The problem, then, is to choose a day on which the winds will be most favorable. Mr. Gregg chose from among the daily weather maps of the North Atlantic on file at the Weather Bureau, May 29, 1906, as a day which would have been a good one for a start. By interpolating weather maps at two-hour intervals he computed for eight divisions of a flight from Newfoundland to Ireland, the direction and velocities of the "gradient" winds, and from these the proper bearings of an airplane's course which would carry it to Ireland with the aid of the wind, in the shortest possible time. He computed not only the bearing of the course, but also the direction in which the airplane would have to move relative to the air in order to maintain the necessary bearing for the stipulated distances of each part of the course. On May 29–30, 1906, an airplane with an air-speed of 90 mi./hr. could have made the flight in 17 hours, whereas in a calm 20 hours would have been necessary.

With the aid of Messrs. Tingley and Paterson of the marine division of the Weather

[1] See *Monthly Weather Review*, 1919, Vol. 47, pp. 65–75.

Bureau, Mr. Gregg also classified the daily weather maps of the North Atlantic for a ten-year period into days when wind conditions were excellent, good, fair, or poor for the journeys both ways and both routes. Grouping the excellent and good days together, the average number of days in May favoring Newfoundland to Ireland flight is 12, Newfoundland to Portugal, 11, and return on both routes, only 2. For June, the corresponding figures are 10, 6 and 2. While on the average there should be plenty of favorable days, individual months vary greatly. Thus, in July, 1906, there were 28 favorable days for the trip to Ireland, but in July 1907, only 4.

Mr. Gregg's general conclusions are worth quoting:

CONCLUSIONS

1. In the present stage of their development and until improvements give them a much larger cruising radius than they now have, airplanes can not safely be used for trans-Atlantic flight except under favorable conditions of wind and weather.

2. Observations of conditions over as great an area as possible, and particularly along and near any proposed course, should therefore be available at as frequent intervals as possible, these observations to include free-air as well as surface conditions.

3. With such observations at hand the meteorologist is able quickly to determine the current, and probable future, wind conditions along a proposed route and to advise an aviator as to the suitability of a day for a flight.

4. If a day is favorable, the meteorologist is able to indicate the successive directions toward which an airplane should be headed in order to keep to any desired course; also, to calculate the assistance that will be furnished by the winds.

5. Inspection of marine weather maps shows that at an altitude of 500 to 1,000 meters conditions are favorable for an eastward trip approximately one third of the time, the percentage being slightly greater along the northern than along the southern route. At greater altitudes the percentage of favorable days materially increases, especially along the northern route. For the westward trip the percentage of favorable days is so small as to make trans-Atlantic flight in this direction impracticable until the cruising radius of aircraft is increased to such an extent that they are relatively independent of wind conditions.

6. All things considered, conditions for an eastward flight are most favorable along the northern course; for a westward flight they are most favorable along the southern course; that is, the prevailing westerlies are less persistent along this course than farther north.

7. There seems to be little choice as to season, for, although the prevailing westerlies are stronger in winter than in summer, yet, on the other hand, stormy conditions are more prevalent in winter, and the net result is about an equal percentage of favorable days in the two seasons. Moreover, the greater fog percentage in summer just about offsets the greater percentage of cloudiness in winter. Fog is a disadvantage chiefly because of its interference in making observations with drift indicators. The Newfoundland fogs in general are of small vertical extent and do not extend far inland. They should not, therefore, prove a hindrance to landing, if the landing field is located some distance from the coast.

8. Most important of all, there is need for a comprehensive campaign of meteorological and aerological observations over the North Atlantic in order that aviators may be given data for whose accuracy the meteorologist need not hesitate to vouch, instead of information based on so small a number of observations, particularly of free air conditions, that the deductions, including some of those in this paper, are assumed and not proved, are given with caution, and are "subject to change without notice."

How some of these conclusions have worked out in actual practise is being discussed in contributions to be published in the *Monthly Weather Review*.

CHARLES F. BROOKS

WASHINGTON, D. C.

SPECIAL ARTICLES

A CHART OF ORGANIC CHEMISTRY, AROMATIC SERIES

THE following chart was made and is used in connection with the elementary organic chemistry course given at the university. The heavy type lines in the benzene rings indicate the double bonds while the light lines indicate the single bonds. In order to emphasize certain characteristic groups, position of substituents in the rings, etc., red lettering was used. In the following miniature

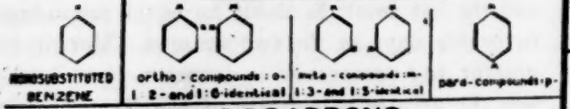
ORGANIC TYPE FORMULAE

AROMATIC SERIES.

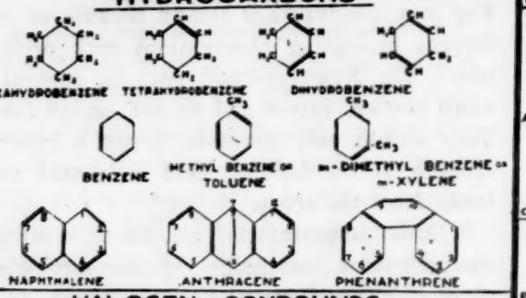
COLUMN 1.

BENZENE

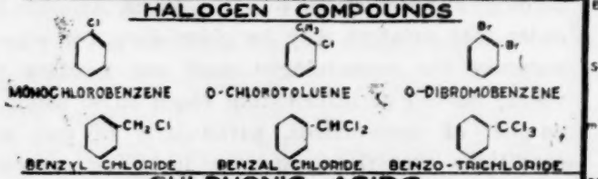
DISUBSTITUTED BENZENES



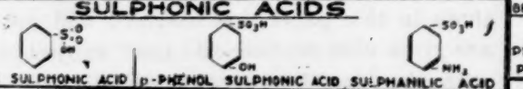
HYDROCARBONS



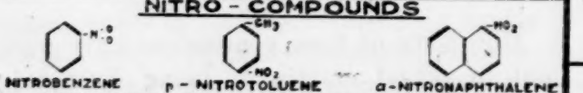
HALOGEN COMPOUNDS



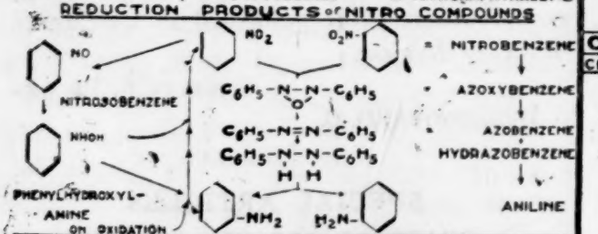
SULPHONIC ACIDS



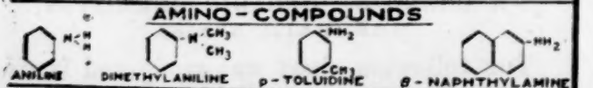
NITRO-COMPOUNDS



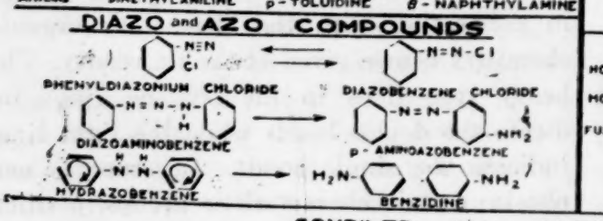
REDUCTION PRODUCTS of NITRO COMPOUNDS



AMINO-COMPOUNDS

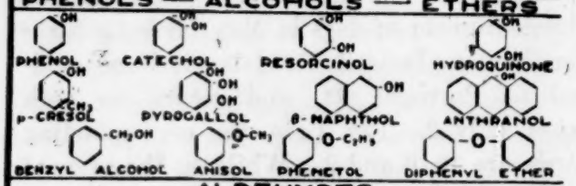


DIAZO and AZO COMPOUNDS

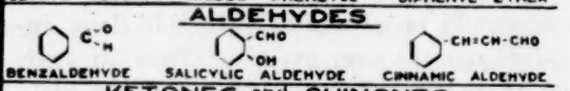


COLUMN 2.

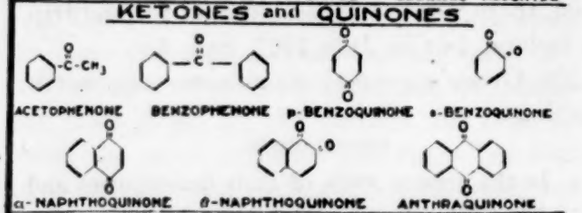
PHENOLS — ALCOHOLS — ETHERS



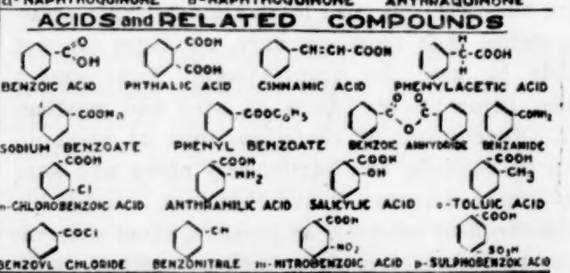
ALDEHYDES



KETONES and QUINONES



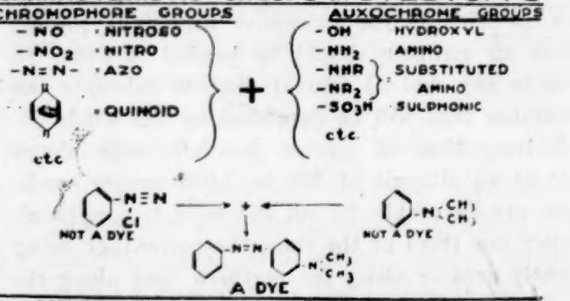
ACIDS and RELATED COMPOUNDS



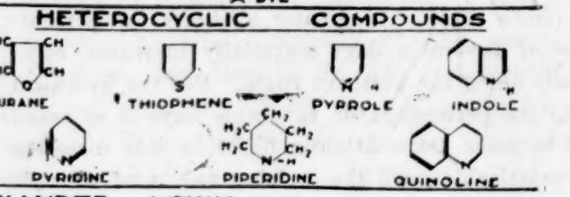
RULES for SUBSTITUTION

PRESENT in POSITION 1.	POSITION ENTERED BY SUBSTITUENTS					
	ALKYL	Cl	Br	I	NO_2	SO_3H
ALKYL	4 (2)	4 (2)	4 (2)	4 (2)	4 (2) 3	4 (2) (3)
Cl	4 (2)	4 (2) (3)	4 (2) (3)	4	4 (2)	4
Br	4 (2)	4 (2) (3)	4 (2) (3)		4 (2)	4
I		4	4	4	4 (2)	4
OH	4 (2)	4 (2)	4 (2)	4 (2)	4 (2)	4 (2)
NH_2	4 (2)	4 (2)	4	4	4 (2)	4 (2)
NO_2	4 (2)	3	3		3 (2, 4)	3 (2, 4)
SO_3H	4 (2)		3		3 (2, 4)	3 (4)
COOH	4 (2)	3	3	3	3 (2, 4)	3 (4)
CN			4		3	

CHARACTERISTIC GROUPS in DYESTUFFS



HETEROCYCLIC COMPOUNDS



COMPILED BY ALEXANDER LOWY

chart the corresponding red lettering can not be shown.

The chart is 98″ × 75″.

An analogous chart of the aliphatic series was described in SCIENCE.

ALEXANDER LOWY
UNIVERSITY OF PITTSBURGH

THE KENTUCKY ACADEMY OF SCIENCE

THE Kentucky Academy of Science held its sixth annual meeting at the University of Kentucky on Saturday, May 3, 1919, with J. E. Barton, president, in the chair. After a brief business session at which a number of new members were elected, the following program was presented:

President's address, by J. E. Barton, "The relation of private forestry to the economic interests of Kentucky."

It was brought out that there are no public forests in Kentucky, the large bodies of forest lands being privately owned, mainly by coal companies. The preservation of timber in Kentucky is therefore a problem in private forestry. It was considered desirable that the legislature should pass some law regulating private forests and stimulating timber development by suitable modification of the methods of taxing timber land.

New fossil invertebrates from a new fossil horizon in the coal measures of eastern Kentucky: W. R. JILLSON, state geologist. A new fossiliferous limestone horizon in the Coal Measures of eastern Kentucky has been discovered by the author who has done sufficient field work on it to demonstrate that it possesses features of fundamental stratigraphic importance to the unmapped geology of this section. A comprehensive collection of invertebrates taken by the author from an outcrop of this horizon on the Dr. G. T. Kendrick farm on the headwaters of Cow Creek, Floyd county, and identified by Professor Charles Schuchert, shows an incomplete list of about forty species of which ten are new and about sixteen very rare. It is a very unusual Pottsville fauna with the characteristic index forms absent. Three other widespread fossiliferous limestones in this same area are noted, all of which possess virgin stratigraphic potentialities. The author tentatively correlates them into the Norton (Middle) and Wise (Upper) Pottsville.

A phase of evolution: W. S. ANDERSON. In every breed of animals it is found that a few are exceptionally potent in passing on their good qualities. The author illustrated this from certain families of horses and advanced some speculations as to the possible cause.

Electrolytic solution glow: DEAN W. MARTIN. In December, 1917, the author observed a glow on the aluminum terminal of an electrolytic rectifier with lead and aluminum electrodes in a 10 per cent. solution of sodium phosphate. It was found possible to produce the glow with solutions of many different salts, of different concentrations, at temperatures from 0 to 100° and with electrodes of aluminum, zinc or magnesium and with voltages ranging from 80 to 1,500. A simple apparatus was exhibited and production of the glow was demonstrated. The observation is published for the purpose of learning whether others have noted or investigated the phenomenon.

The bacteriological descriptive group number: D. J. HEALY. The author has found it necessary to develop the group number of the Society of American Bacteriologists in such a manner that it will indicate the action of soil bacteria on nitrogenous compounds, organic acids and sulfur. The group number, enlarged in this manner, has proved valuable in the study of soil bacteria.

A brief discussion of Lexington sewage purification: H. D. SPEARS. A modern sewage-disposal plant operated by gravity takes care of 3,000,000 gallons containing 2½ tons of suspended solids. The sewage passes through bar screens and grit chambers into Imhoff tanks, where bacterial action takes place and sludge is deposited. The effluent passes into "dosing tanks" which empty automatically every 15 minutes into filter beds, 2 acres area, of coarsely broken limestone covered with broken granite, together 6 feet deep. Thence the effluent passes through secondary sedimentation tanks and into a near-by stream. It is clear, odorless and has a "relative stability" of about 95 per cent. The sludge from the Imhoff tank is drawn off periodically into drying beds whence it is returned to the soil, when spadable.

A specimen of lodestone from Kentucky: A. M. PETER. A specimen of titaniferous magnetite possessing polarity was exhibited, which had been sent in from Edmondson county.

The composition of the ash of crab grass (Digitaria sanguinalis) as affected by the soil in which it is grown: G. DAVIS BUCKNER. Crab grass (*Digitaria sanguinalis*), when grown in garden soil, contains an ash which is 16.1 per cent. larger than the ash of the same species when grown in a 4-inch limestone roadway. The comparative composition

of the ashes shows that the sample grown in limestone contains 22.7 per cent. more P_2O_5; 44.0 per cent. more CaO; 27.6 per cent. more MgO, and 18.8 per cent. less K_2O than the one grown in garden soil. The external appearance of these two samples was identical.

Some experiments in adsorption phenomena: P. L. Blumenthal, D. J. Healy and A. M. Peter. (Presented by P. L. Blumenthal.) The adsorption of crystal violet by powdered phlogopite was demonstrated and it was shown that the mineral which had been acted upon by bacterial cultures withdrew from dilute solution more of the dye than did the untreated mineral, weight for weight.

An improved astatic galvanometer: C. C. Kiplinger. A new coil for an astatic galvanometer has been designed, the simplicity and efficiency of which is described. A current equivalent to 1° C. temperature difference between the terminals of a 5 couple iron-germansilver thermopile shows a swing of 8 inches on a scale 50 inches from the instrument.

A modified ebullioscopic apparatus for accurate molecular weight determinations: C. C. Kiplinger. A method is suggested whereby an ebullioscopic apparatus may be made independent of variations in atmospheric pressure. It has been shown that molecular weights may be determined by this method of comparison without any knowledge of the constant for the given solvent, thus rendering the experiment independent of previous experimental errors involved in the determination of *C*.

Notes on the viability of tobacco seed: G. C. Routt. Experience in Canada shows that home-grown seed germinates better than seed from more southern localities and a higher percentage of viable seed are set during bright, warm weather than when cool, cloudy weather prevails. A higher percentage of germination is obtained from seeds gathered when the pods are half brown than when they are left until the pods are wholly brown. Tobacco seed retains its viability for many years; a sample eight years old having shown 95 per cent. germination, and one twelve years old, 70 per cent.

The projection of water waves: N. F. Smith. A simple method was described by which surface waves in water could be produced and projected by means of the lantern so as to illustrate important characteristics of wave motion.

The McCreary county aerolite: A. M. Miller. Portions of the aerolite which recently fell in McCreary county, Ky., were exhibited and an account of its occurrence was given. The body is stony and nearly white, containing very little metallic iron. Dr. Peter reported a qualitative chemical analysis showing that the mineral is essentially a magnesium silicate, probably enstatite. Metallic particles amounting to less than 0.2 per cent. were shown to be nickeliferous iron. Chromium, phosphorus and sulfur were detected.

The discovery of a mica deposit in eastern Kentucky: W. R. Jillson. The author announces the discovery of a single stratigraphic unit deposit of nearly pure flake mica in the Pottsville of Pike county—the first in Kentucky.

At the afternoon session Dr. E. B. Hart, of the University of Wisconsin, Madison, Wis., addressed the academy on "The widening viewpoint in animal nutrition."

An illustrated discussion was given of the most important results of investigations concerning nutrition which had been conducted in his laboratory at the University of Wisconsin and elsewhere. A brief account was given of the accumulative toxic properties of wheat embryos and the corrective properties of corn stover which, however, did not equal the legume hays in this respect. The vitamine factor was briefly discussed as were the subjects of roughage, protein efficiency, and the necessity of inorganic salts. Finally it was stated that a balanced diet must contain sufficient fuel value, efficient proteins, food accessories, roughages and inorganic salts and be sensibly free from toxic material.

Officers were elected as follows: Dr. Paul P. Boyd, president; Dr. Walter H. Coolidge, vice-president; Dr. Alfred M. Peter, secretary; Mr. J. S. McHargue, treasurer.

Alfred M. Peter,
Secretary

SCIENCE

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